

Citation:

Levy DT, Mallonee S, Miller TR, Smith GS, Spicer RS, Romano EO, Fisher DA. Alcohol involvement in burn, submersion, spinal cord, and brain injuries. *Med Sci Monit.* 2004; 10(1): CR17-CR24.

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Study Design:

Cross-Sectional Study

Class:

D - [Click here](#) for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To determine the relationship between alcohol involvement and outcome of injury (both fatal or non-fatal) by sex, age, race, time and the cause of injury using multiple years of data on fire and scald burns, submersions, spinal cord injuries (SCIs) and traumatic brain injuries (TBIs).

Inclusion Criteria:

- Data were obtained from a statewide, population-based injury surveillance system in Oklahoma. Reporting sources included all hospitals and rehabilitation facilities and the Office of the Chief Medical Examiner.
- Additional reporting sources for supplemental data were Oklahoma Traffic Collision Records, state and local fire marshals, Oklahoma Lake Patrol, emergency medical services and a statewide newspaper clipping service
- Only Oklahoma residents were included in the registry
- The study involved secondary analyses of identified data from 1988 to 1992.

Exclusion Criteria:

Not stated.

Description of Study Protocol:**Design**

Non-concurrent cohort study.

Blinding Used

Yes.

Statistical Analysis

- Fire burns, scalds and other burns, submersions, SCIs and TBIs were analyzed separately
 - Those with unknown alcohol use and no source from which to make a determination were classified as unknown
 - The case was classified as ‘alcohol involved’ if the victim involved in the injury was reported by any source as drinking the day of the injury
 - Distinguished selected factors included unintentional and intentional (suicides, homicides and assaults), motor-vehicle-related (SCIs and TBIs) and unintentional work-related injuries (burns), and compared fatal and non-fatal injuries. Fatal cases involved death within six months for SCIs and within one month for TBIs, burns, and submersions.
- Chi-square analyses were used to compare alcohol involvement by gender and by fatal vs. non-fatal injuries. Logistic regression analyses were used to isolate the independent roles of alcohol involvement and other socio-demographic and situational factors in fatal relative to non-fatal injuries. In particular, whether an injury was fatal was predicted by the variables, sex, race, age group, night (9:00 P.M. to 8:59 A.M.) or day (9:00 A.M. to 8:59 P.M.), alcohol involvement, drug involvement, cigarette involvement (in burn cases) and boat-related (in submersions).
- In calculating the percentage alcohol involved, cases with alcohol involvement unknown were omitted. To examine for bias in alcohol ascertainment, a logistic regression equation was estimated for each injury type to determine whether cases with unknown alcohol involvement were systematically related to variables in our sample.
- Given the broad definition of alcohol involvement used in the surveillance system, the findings are placed in perspective by comparing them to the percentage of people who imbibed alcohol on an average day. Dividing the percentage injured after drinking by age group by the corresponding percentage of drinking provides a rough measure of the relative risk (RR) of drinking.
- This procedure may under-estimate risk slightly since people injured while sober might have taken a drink later in the day if they had been in the uninjured comparison group.

Data Collection Summary:

Timing of Measurements

1988 to 1992.

Dependent Variables

Type of injury (fatal or non-fatal, intentional or unintentional work-related or other unintentional):

- Fire burns
- Scald and other burns
- Submersions
- SCIs and TBIs.

Independent Variables

- Alcohol involvement
- Gender
- Sex
- Race
- Age group
- Night (9:00 P.M. to 8:59 A.M.) or day (9:00 A.M. to 8:59 P.M.)
- Alcohol involvement
- Drug involvement
- Cigarette involvement (in burn cases)
- Boat-related (in submersions).

Description of Actual Data Sample:

- *Initial N*: 11,376 persons were identified
- *Age*: A mean age for the sample was not reported
- *Other relevant demographics*: The equations examining whether alcohol ascertainment was known revealed significant demographic differences for submersion, burn and SCIs
 - Submersion cases with unknown alcohol involvement were more likely to be non-fatal and under age 15 or over age 24 years
 - Burn cases with unknown alcohol involvement were more likely to be under age 45 or over age 64 years
 - SCI cases with unknown alcohol involvement were more likely to be non-fatal and occur during the day
 - In TBI cases, unknown alcohol cases were significantly more likely to be female, non-fatal, occur during the day and be over age 64 or under age 15 years
- *Location*: Oklahoma.

Summary of Results:

Key Findings

- A total of 11,376 injured persons were studied and alcohol was known for 8,346 persons (73%), 86% of fatalities and 69% of non-fatal cases. Total alcohol involvement ranged from 3.8% in scald burns to 34.2% for SCIs.
- Fire burns: Mean alcohol involvement was significantly higher among persons killed than among survivors (30.7% vs. 11.0%, $X^2=101.1$, $P<0.001$). Among persons who were intentionally burned by fires and flames, alcohol involvement was similar for fatal (28.2%) and non-fatal (32.6%) cases ($X^2=0.2$, NS). A greater percentage of fatal non-work-related unintentional cases (32.5%) than non-fatal cases (11.7%) were alcohol involved ($X^2=88.8$, $P<0.001$). Among non-fatal cases, a greater percentage of non-work-related unintentional injuries (11.7%) than work-related unintentional injuries (3.1%) were alcohol involved ($X^2=14.8$, $P<0.001$). Alcohol involvement in non-work-related fire burns was lowest among victims aged zero to 14 for both fatalities and injuries.
- Fire burns: Excluding work-related fire burn cases, alcohol-involved burn victim was more than five times as likely to die as a non-alcohol-involved fire burn victim ($P<0.001$). Burns that occurred at night time ($P<0.001$) and to those over age 65 years ($P<0.01$) had the greatest likelihood of being fatal. Burns to those aged 15 to 24 years ($P<0.01$), male ($P<0.05$), and non-Caucasian ($P<0.05$) were the least likely to be fatal. Tobacco involvement also nearly doubled the risk of dying ($P<0.001$).

- Scalds and other burns: Mean alcohol involvement was similar among persons killed and among survivors (5.6% vs. 3.8%, $X^2=0.2$, NS.). All cases of intentional scald burns and unintentional work-related scald burns were non-fatal; alcohol involvement was 8.8% and 2.0%, respectively. Because of the small sample size of fatal non-work-related scald victims, comparisons were not made between fatal and non-fatal cases.
- Submersions: Total alcohol involvement was similar for unintentional (23.9%) and intentional (17.4%) cases ($X^2=0.5$, NS). Fatal cases were significantly more likely to be alcohol-involved (31.0%) than non-fatal cases (6.2%) ($X^2=43.0$, $P<0.001$). Alcohol-involved submersion cases were more than two times more likely to be fatal than non-alcohol-involved cases ($P=0.08$), even when controlling for victim age. Submersions that occurred at night ($P<0.01$) and in boating incidents ($P=0.06$) were more likely to be fatal, and female victims were less likely to die. Victims age 15 and over were six to 15 times more likely to be fatal cases than victims under age 15 years ($P<0.001$).
- Spinal cord injuries: Alcohol involvement between fatal and non-fatal cases (33.3% vs. 34.1%, $X^2=0.1$) was not significant. Among SCI cases associated with motor vehicle crashes, total alcohol involvement was slightly higher among non-fatal cases (42.3%) than among fatal cases (34.2%) ($X^2=2.4$, NS). Among non-fatal SCI cases, alcohol involvement was nearly twice as high in intentional (48.4%) than in unintentional (25.8%) injuries ($X^2=12.4$, $P<0.001$). Victims ages 15 to 24 were less likely to die ($P<0.05$) and victims ages 65 and older were nearly four times more likely to die ($p<0.01$) than victims in other age groups.
- Traumatic brain injury: Of cases with known alcohol involvement, 38.5% of fatal and 42.3% of non-fatal cases were victim alcohol-involved ($X^2=4.8$, $P<0.05$). Among intentional injuries, 37.9% of fatalities and 70.4% of survivors were alcohol involved ($X^2=119.0$, $P<0.001$). Alcohol involvement was higher among males (45% of cases) than females (27% of cases) ($X^2=117.2$, $P<0.001$). Nighttime and alcohol-involved injuries were slightly less likely to be fatal ($P<0.001$) and cases aged 15 years and older and involving females were more likely to be fatal compared to those under age 15 ($P<0.001$ for all four variables). The finding that the unknown alcohol-involved cases were systematically related to these factors suggests that these results may be systematically related to the ability to determine alcohol involvement.

Author Conclusion:

- The study documented high rates of victim alcohol involvement in several types of serious trauma in Oklahoma
- Comparisons of drinking status between injury victims and the general population revealed that people face substantially elevated risks of fire burn, submersion, spinal cord injury and traumatic brain injury but not of scald burn on days that they drink alcohol.

Reviewer Comments:

The authors noted the following limitations of the study:

- *The system in Oklahoma only collected data on a limited, well-defined group of injuries, namely severe burns, submersions, SCIs and TBIs. In addition, Oklahoma may not be typical of other states.*
- *Victim alcohol use was determined from multiple sources and some more reliable than others*
- *The surveillance system's definition of alcohol involvement (any drinking or suspected*

drinking of alcohol the day of the injury) is extremely broad, lacking any time or quantity parameters

- *Like most previous studies of submersion, the current one failed to account for endogenous alcohol production that occurred after prolonged submersion of the body. Victims submerged for more than 24 to 48 hours are subject to fermentation that creates false alcohol positive test results.*
- *Alcohol involvement does not imply attribution or causality.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions

1.	Was the research question clearly stated?	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	Was the selection of study subjects/patients free from bias?	No
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	No
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	No
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
3.	Were study groups comparable?	No

3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	No
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	No
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	Was method of handling withdrawals described?	N/A
4.1.	Were follow-up methods described and the same for all groups?	N/A
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	N/A
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	N/A
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	Was blinding used to prevent introduction of bias?	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A

6.	Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	No
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	Yes
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	Were outcomes clearly defined and the measurements valid and reliable?	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	N/A
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	No
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	Was the statistical analysis appropriate for the study design and type of outcome indicators?	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes

8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	No
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	Are conclusions supported by results with biases and limitations taken into consideration?	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	Is bias due to study's funding or sponsorship unlikely?	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes